

REMARKS

Summary of Office Action

In the Office Action of January 24, 2007 the Examiner rejected claims 12 and 26 under 35 U.S.C. §103(a) as being unpatentable over Mostafavi (USP 6,959,266; hereinafter Mostafavi '266) in view of Sackner et al. (USP 6,413,225). The Examiner next rejected claims 13 and 27 under 35 U.S.C. §103(a) as being unpatentable over Mostafavi (US Pat. Appl. Pub No. 2004/0116804; hereinafter Mostafavi '804) in view of Sackner et al. The Examiner also indicated the allowability of claims 2-11, 14, and 16-25. Such indication is sincerely appreciated. With respect to the outstanding rejections, Applicant respectfully disagrees that that which is called for in claims 12, 13, and 26 is disclosed, taught, or suggested in the art of record. With respect to claim 27, Applicant has amended claim 27 to make explicit which was previously implicit in the wording of the claim.

Prior art rejections of remaining claims

The Examiner rejected claim 12 under 35 U.S.C. §103(a) as being unpatentable over Mostafavi '266 in view of Sackner et al. stating that "Mostafavi '266 discloses a radiation therapy system comprising a laser sensor adapted to monitor chest displacement during breathing (column 3, lines 48-57)...." Claim 12 calls for, in part, a laser displacement sensor adapted to monitor displacement of a patient's chest to provide a chest displacement signal. Neither Mostafavi '266 nor Sackner et al. discloses such a radiation therapy system. Contrary to the Examiner's interpretation, Mostafavi '266 (and Mostafavi '804) disclose radiation therapy systems equipped with broadband illumination systems to assess patient respirations performance.

As described in column 12 of Mostafavi '266, an IR illumination source 602 includes a number of LED elements 604. The LED elements 604 are positioned to interact with a number of retro-reflective markers 700 such that light emitted from the LED's is reflected by the markers 700 to a camera 108. The respiration monitoring system of Mostafavi '266 does not include a laser displacement sensor as called for in

claim 12 but includes a monitoring system that includes a number of LED's, reflectors, and a IR sensitive camera as cited above.

Comparatively, Sackner et al. is directed to a method of calibrating breathing monitors with transducers placed on both a rib cage and an abdomen of a patient. One of ordinary skill in the art would readily appreciate that respiration monitoring transducers such as those disclosed in Sackner et al. would interfere with the operation of the radiation therapy system as presently claimed. Accordingly, Applicant believes claim 12, and the claims that depend therefrom, are patentable over Mostafavi '266 in view of Sackner et al. as the references not disclose, teach, or suggest each and every element called for in claim 12. Furthermore, there is no motivation absent Applicant's own disclosure, to combine these references in the manner suggested by the Examiner.

The Examiner rejected claim 26 as being unpatentable over Mostafavi '266 in view of Sackner et al. asserting that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to have made the method of Mostafavi'266 and used a spirometer to measure airflow and a circuit to combine the airflow and chest displacement signals to obtain a corrected respiration signal, as taught by Sackner, in order to more accurately monitor respiration during radiation gating." Applicant respectfully disagrees.

Claim 26 defines a method of radiation therapy system which includes, in part, controlling radiation delivered to a patient according to a corrected respiration signal generated by the combination of an air flow signal and a chest displacement signal. Assuming arguendo that Mostafavi '266 and Sackner et al. included the requisite motivation to combine and reasonable likelihood of success, the combination of references fails to disclose, teach, or suggest controlling radiation delivered to a patient according to a corrected respiration signal as called for in claim 26. Simply, Sackner et al. discloses a system wherein one respiration monitoring system is calibrated to the intermittent use of another respiration monitoring system. Sackner et al. discloses a respiration monitoring system that includes a non-invasive respiration monitor and a spirometer configured to assess operation of the non-invasive respiration monitor. The spirometer or other airway monitoring device is used during a monitoring period to

measure a tidal volume and the measured tidal volume is compared to a calculated tidal volume. The comparison of the calculated tidal volume value to the measured tidal volume is used to determine the effectiveness of the non-invasive ventilatory device. There is no disclosure in Mostafavi '266 or Sackner et al. for combining the air flow signal in a chest displacement signal to provide a corrected respiration signal and controlling radiation dosage delivered to a patient according to the corrected respiration signal as called for in claim 26. Accordingly, Applicant believes claim 26 is patentably distinct thereover.

The Examiner next rejected claims 13 and 27 under 35 U.S.C. §103(a) as being unpatentable over Mostafavi '804 in view of Sackner et al. stating that "Mostafavi '804 discloses a medical imaging system comprising a laser displacement sensor adapted to monitor chest displacement during breathing and provide a chest displacement signal (paragraphs [0044]-[0045], [0047])" and that "Sackner teaches a system for monitoring respiration ... [that includes] a calibration circuit that combines the airflow and chest displacement signals to obtain a corrected respiration signal (column 3, lines 38-48), in order to most [sic] accurately monitor the patient's respiration." The Examiner further concludes that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to have made the system of Mostafavi'804 with a spirometer for measuring airflow and a circuit to combine the airflow in chest displacement signals to obtain a corrected respiration signal, as taught by Sackner, in order to more accurately monitor respiration while capturing images." Applicant respectfully disagrees.

Claim 13 calls for, in part, a laser displacement sensor adapted to monitor displacement of a patient's chest with breathing to provide a chest displacement signal. Mostafavi '804 does not disclose a laser displacement sensor system as called for in claim 13 but discloses an IR LED illuminator, reflector, and camera system similar to Mostafavi '266. This failure of the Mostafavi references to disclose, teach, or suggest a laser displacement respiration sensor system as called for in the present claims is readily apparent from the lacking of the references use of the term 'laser' anywhere in the 18 pages of text of Mostafavi '804 or the 16 columns of text of Mostafavi '266. Mostafavi '804 and Mostafavi '266 simply do not disclose a laser displacement sensor system as

called for in the present claims. Accordingly, Applicant believes that which is called for in claim 13 is patentably distinct thereover.

Claim 27 has been amended to more clearly define the present invention. Claim 27 defines a method of medical imaging that includes the steps of monitoring a patient's breathing with a spirometer, monitoring the patient's breathing with a chest displacement sensor, and combining the information acquired with the spirometer and the chest displacement sensor to provide a corrected respiration signal. Claim 27 further calls for acquiring component image signals from a patient over different phases of respiration as determined by the corrected respiration signal. The art of record simply fails to disclose, teach, or suggest a system configured for such operation. One of ordinary skill in the art would appreciate that the combination of the respiration monitor calibration system of Sackner et al. would be inoperable with a radiation system in as much as the rib and abdomen bands would interfere with the radiation delivery system. Furthermore, the combination of the disclosure of Sackner et al. with either of Mostafavi '266 or Mostafavi '804 would yield a system wherein one respiration monitoring modality is used to calibrate another respiration monitoring modality. There is no disclosure, teaching, or suggestion in the art of record that the information acquired with two respiration monitoring modalities is combined to manipulate operation of a patient imaging machine as called for in the present claims. Simply, there is no suggestion or motivation in the art of record to combine the references in the manner done by the Examiner.

Conclusion

Applicant believes claims 2-14 and 16-27 are patently distinct over the other record. Applicant appreciates the indication of allowability of claims 2-11, 14, and 16-25. Upon consideration of the remarks and amendments presented herein, Applicant believes claims 12, 13, 26, and 27 are also in condition for allowance. Accordingly, Applicant respectfully requests a notice of allowance of all of the presently pending claims. Although no fees are believed payable with this submission, the Office is hereby authorized to charge deposit account number 50-1170 for any fees which may be deemed necessary. The Examiner is cordially invited to contact the undersigned, should any matters remain unresolved, which would prevent the passage of the above-captioned matter to issuance.

Respectfully submitted,



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